TECHNOLOGY TIMES

A newsletter published by Standard Oil Engineered Materials Company for those interested in the most innovative products for optimum crop yields.

Volume I Issue I **First Quarter -- January, 1988**

SCHEDULER[R] -- MAKING DECISIONS THE EASY WAY

One commonly asked question is always "Who is using the Scheduler[R] Plant Stress Monitor and what do they think of it?" That's a fair question, so in each issue you will be meeting a grower like yourself who has adopted the latest in plant management techniques. Our featured grower this issue is Salyer American Farms where Eric Muller is head agronomist and Erica Jensen the agronnomist in charge of irrigation scheduling and fertility. Salyer American is a large diversified operation in Corcoran, CA. Located in the Tulare Lake Basin crops include cotton, tomatoes, sugar beets, almonds, seed alfalfa, sod and several other vegetable crops.

Jensen, a graduate of Cal Poly, San Luis Obispo, has a degree in agronomy. In her role as an agronomist she utilizes the Scheduler on both the Fresno and King's County operations of Salyer American.

Erica says what she really likes is the ease of operation, quick sampling time, and confidence in the Scheduler's decision making capabilities. "Compared to the other methods I have used in the past, the Scheduler has saved me a tremendous amount of time. It gives me the ability to scan a large area fast and effectively. I also like the fact that I can measure the complete environment around the plant. I correlate the plant's stress level readings from the Scheduler with the soil moisture readings taken using soil probes. I use it on plants grown in all types of soils to obtain the viable plant stress information needed to make my irrigation decisions. Overall, I have been very pleased with the results this past season. Irrigation management is so easy when I let the Scheduler make the irrigation decisions for me."

Salyer purchased their Scheduler last summer. Erica is so confident with the Scheduler that she plans to make her irrigation decisions next season based on the Scheduler readings.

INNOVATIVE IRRIGATION TOOL--THE SCHEDULER[R]

Scheduling irrigation and managing plant stress is not an easy job. However, that job is now simpler due to a product called the Scheduler[R] Plant Stress Monitor. The Scheduler is made by the Sensor Technologies group at Standard Oil Engineered Materials Co. The group primarily focuses on products that have practical applications for the grower. In this case, the Scheduler, an 8 pound hand-held device, helps make those "Should I" or "Shouldn't I" decisions more easily.

The Scheduler's sensor gun houses 4 separate sensors in 1 integrated package. Pull the trigger and readings every 1/4 second are taken to measure the leaf temperature and the environmental factors influencing that temperature. Those factors include air temperature, relative humidity, and the intensity of the sunlight. Leaf temperature is the indicator of how well the crop is absorbing moisture from the soil profile. An infrared thermometer *(continued on page 2)*

STATE-OF-THE-ART IRT

Many Scheduler[R] Plant Stress Monitor owners have used or seen infrared temperature sensors (IRTs) before, but most probably do not know the secret behind our state-of- the-art IRT.

IRTs work by exposing a sensor in the IRT to thermal radiation from a target. The sensor, called a thermopile, produces an electrical signal which can be converted to the target's temperature. The technology is decades old, but was originally used only for measuring objects many hundreds or thousands of degrees hot. Signals from plants and anything else near ambient temperature are weak and much harder to measure. Lenses help to amplify the signal somewhat, but IRTs suitable or agricultureal research were not developed until the 1970s.

To overcome problems with near-ambient measuring, IRT developers were forced to resort to "Chopper Stabilization" a device that works in a similar manner to the shutter of a camera. They recognized that this brute force, mechanical solution was not perfect, because choppers break down. And when we decided to build Schedulers, we looked for a better way.

As we found out, every IRT supplier who could meet our performance specifications still used chopper technology, so our challenge was to go beyond that barrier. In Standard Oil's research laboratory we applied the latest semiconductor technology and replaced the mechanical chopper with a digital one.

By doing our chopping electronically, with hardware and software built into each monitor, we have advanced the state-of-the-art. But if you ever see an IRT with a chopper, don't be disrespectful--even the Model T was an innovation once.

94 . . 93 . . 92 . .

Its frustrating. In only a few seconds you've got your Scheduler[R] Plant Stress Monitor out of its bag, field and crop selected, and you're ready to take samples, but wait! It's going to count down 94 seconds, and that seems like forever. Why so long? It just takes time for your sensor gun to adjust to the new environment.

To be more exact, all of the sensors will read accurately as soon as the Scheduler is on, but the air surrounding the Scheduler's temperature will not read accurately. By waiting you increase the accuracy of your readings.

Watch the air temperature shown on the screen. When it's stable, you're ready to shoot. After all, the countdown isn't all that bad. In fact, many customers rated it good or excellent in a recent survey.

So 94 . . 93 . . 92. .Shoot down irrigation problems!

Call Us:
IT'S FREE!

(800) 356-0458

INNOVATIVE TOOL

(contunued from page 1) in the sensor gun detects heat coming from a plant's leaf and records the temperature reading. Plant stress, or elevated leaf temperature, is detected 3 to 5 days before crop stress can be visually detected.

The sensor gun's readings are immediately transmitted to a shoulder-pack computer where its 64K microprocessor organizes and calculates plant stress from the inputs provided by the infrared thermometer and sensors in the sensor gun. See on-the-spot results of the sampling on the LCD display located on the shoulder-pack. The graphic readout shows the pattern of plant stress as it develops. Data for up to 30 individual fields in each of 7 crops during a 15-day period can be retained in the Scheduler's memory. Instant crop management decisions can be made to reach targeted yields and to maintain high levels of crop quality.

For more information on the Scheduler, please contact Standard Oil Engineered Materials Company, P.O. Box 391316, Solon, OH 44139 or phone us toll free (800) 356-0458.

CROP TALK, HEARD ON THE STREET

No, not on Wall Street, not even LaSalle Street, the famous home of the Merchantile Exchange and the Chicago Board of Trade. **Then where?**

During 1988, you will have the opportunity to hear CROP TALK along county roads from Modesto and Fresno to Yuma, not to mention Indio, Tucson, Bakersfield and Greenville, Mississippi. All across the nation wherever growers are striving for maximum yield and efficient irrigation, our 1988 advertising campaign will feature the message CROP TALK, and we thought you'd like to know why.

So why? We chose the CROP TALK heading because we felt it best communicated the most important benefit the Scheduler® Plant Stress Monitor provides to any grower's farming operation. Whether you grow permanent or row crops, your challenges in efficient production are ultimately the same: How to maximize profits and minimize costs with as little risk as possible. Whether we deal with people or plants (plants have been found to be consistently more honest), the best way to determine if a problem exists is to go directly to the source. The Scheduler, like no other tool, lets you go directly to the plant to verify its health--and that means the assurance of maximum yield as well as your peace of mind.

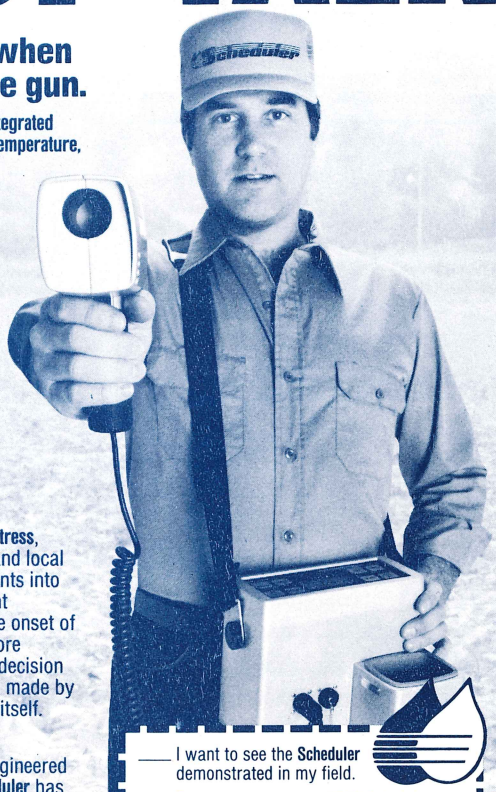
CROP TALK, it may not be heard of on New York's Fifth Avenue, but you can be sure it will be heard on the streets that really count, the ones that pass by your farm.

CROP TALK

Plants don't lie when they're under the gun.

The Scheduler,® a portable, integrated sensor package, measures crop temperature, air temperature, relative humidity and solar radiation in your field for direct and instant plant feedback.

You've read about the **Scheduler** Plant Stress Monitor, maybe seen it at an ag show. With it, growers time irrigations to critical crop growth changes — and reduce **unnecessary** irrigations, saving water, energy and labor costs without loss of yield.



Advanced crop management tool

It works by monitoring crop **stress**, translating leaf temperature and local field environment measurements into on-the-spot plant management information. (It can predict the onset of yield-robbing stress days before there's visible evidence.) The decision to irrigate or wait can now be made by a direct signal from the plant itself.

Proven in use

Developed by Standard Oil Engineered Materials Company, the **Scheduler** has proven itself a money saver — and a money maker — for producers from California to the Mississippi Delta.

See for yourself

We're arranging hands-on demonstrations of the **Scheduler** with growers in your area. Phone or mail the coupon and we'll tell you where and when.

For a demonstration, call 1-800-356-0458 or mail this coupon today.

___ I want to see the **Scheduler** demonstrated in my field.

___ Please send me your FREE **Scheduler** Information Packet.

Name _____

Address _____

City _____ State _____

Zip _____ Phone _____

Mail to: **STANDARD OIL** ENGINEERED MATERIALS
SENSOR TECHNOLOGIES
P.O. Box 391316, Solon, Ohio 44139

ASK DR. G

Dr. Bronson Gardner (Dr. G), Product Technical Manager, is ready to answer your specific crop related questions. Dr. G has worked with the USDA to create the Crop Water Stress Index and was involved in the development of the innovative irrigation scheduling device known as the Scheduler® Plant Stress Monitor. Feel free to write to Dr. G. at Standard Oil Engineered Materials Company, P. O. Box 391316, Solon, OH 44139. Dr. G will answer your questions in each edition of Technology Times.

A PICTURE IS WORTH . . .

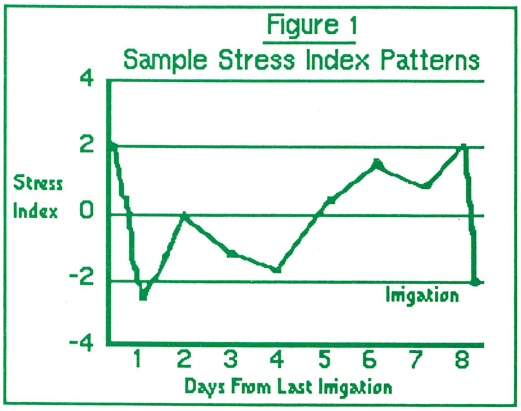
Table 1 shows a typical stress pattern during an irrigation cycle. Unless you spend a great deal of time studying Table 1, the odds are you won't be sure what the numbers mean.

Contrast your reaction to Table 1 with Figure 1. The same information is now represented graphically. The trends are evident. You can tell in a matter of seconds what has been happening.

Table 1

No. Days From Last Irigation	Stress Index
1	-3.0
2	0.0
3	-1.0
4	-1.5
5	0.5
6	1.6
7	1.0
8	2.2* Irigation

Figure 1
Sample Stress Index Patterns



SCHEDULER® WINS TOP AWARD

The Scheduler® Plant Stress Monitor was named to an elite group of top innovations during 1987 by the American Society of Agricultural Engineers.

The AE50 award is given based upon the recommendation of a panel of experts who reviewed hundreds of product nominations. The panel selected those considered most likely to make "worthwhile contributions to the advancement of engineering in agriculture." The products chosen contribute to more cost effective production, added product value, and improved quality for agriculturalists.

The 12,000 member society presented the award to Standard Oil Engineered Matererials for the Scheduler Plant Stress Monitor at their annual December meeting in Chicago.

The Agricultural Engineering 50
Outstanding innovations in product or systems technology during 1986-87

Standard Oil Engineered Materials Company
Sensor Technologies
P. O. Box 391316
Solon, OH 44139

SHOOT DOWN IRRIGATION PROBLEMS . . .

LOOK INSIDE FOR MORE INFORMATION

TECHNOLOGY TIMES

A newsletter published by Standard Oil Engineered Materials Co. for those interested in the most innovative products for optimum yields

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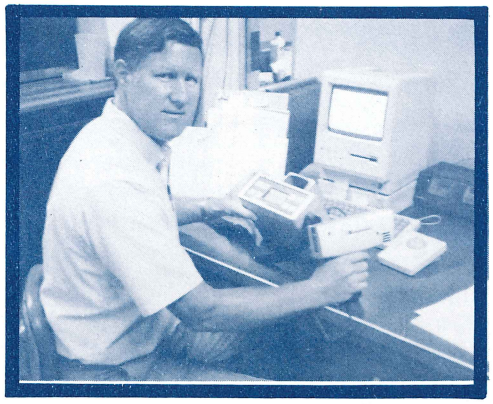
PRACTICAL FOR THE GROWER . . . ABSOLUTELY!

By: J. K. Riley, Marketing Manager

Just ask Dr. Charles Krauter, Professor of Irrigation Science at California State University, Fresno. Krauter, A California native and a graduate of the University of California, Davis, has three years of hands-on, practical experience with the Scheduler® Plant Stress Monitor. Krauter says, "It is the best tool we have seen to date for monitoring crop stress and we have tried them all."



Krauter has researched several crops such as grapes, almonds, oranges, tomatoes, cantaloupes, and watermelons. "The Scheduler has provided us with quick and reliable management information on all these crops. For example, on grapes we have been able to make direct stress correlations to bunch rot in Chenin Blancs. With crops such as tomatoes and melons we can make sure the plant stress is minimal for optimum yield and/or quality. Then there are other crops that we can intentionally stress at certain times throughout the growing season to help reach our management objectives."

Although the Scheduler is an excellent tool for research, it was designed to be used by growers themselves. Krauter recommends the Scheduler to any grower wanting accurate plant-based information. "A grower needs the quickest and earliest detection possible and the Scheduler acts as a good set of eyes. A grower can now get direct feedback from the plant's themselves to aid in the decision making process. Even though climatic conditions change from year to year, a grower can repeat those things he did right by having quantified plant information."

Krauter is planning to continue full-scale research on several

(continued on page 3)

PLANTS BEHAVIOR -- A PREDICTABLE THING

by: L. P. Bucknell, Sr. Sales Correspondent

The plant stress index is a new way for growers to control crop stress, ensuring healthy crops and maximum yield. Developed by the Standard Oil Engineered Materials Co., the index is based on USDA and university research of plant leaf temperature, its role in identifying crop stress, and its influence on irrigation scheduling.

Leaf temperature is a vital sign of plant health and an important part of the plant stress index. It is an indication of how well a plant is absorbing moisture from the soil. Because the index offers precise information on the plant's health, you can identify crop stress three to five days before stress can be visually detected. Irrigation timing can be based on crop requirements at certain growth stages and points critical to yield.

Generally, a well-watered healthy plant has a temperature cooler than the surrounding air temperature. Just as a rise in temperature causes a person's body to feel warm to the touch, so does a plant leaf predictably feel warm to the touch when its temperature goes up.

Leaf temperature is affected by the rate of evaporating moisture from its surface. This rate of evaporating moisture is known as the transpiration rate. The transpiration rate determines the plant leaf temperature and its ability to optimize plant growth and production. Water stress causes the leaf's transpiration rate to lower and the leaf temperature to rise.

To identify water stress and the correct leaf temperature, air temperature, relative humidity, and intensity of the sunlight must also be measured. The plant stress index is calculated based upon all of these influences on the plant, and provides growers with

(continued on page 2)

QUALTIY SPUDS . . . Here's How

by: Dr. B. R. Gardner, Technical Manager

Extensive testing by Oregon State University has demonstrated that high yielding, high quality potatoes can be grown with confidence using the Scheduler® Plant Stress Monitor. In 1986 and 1987, test results show that moisture stress effects on potatoes occur in three periods:

Period I: June thru Mid-July
Period II: Mid-July thru Mid-August
Period III: Mid-August thru Harvest

This test was conducted using sprinkler and flood irrigated fields.

Stress during Period I primarily affects the quality of the potatoes. The greater the stress during this period, the lower the percent No. 1 tubers at harvest.

Stress during Period II primarily affects total tonnage. The greater the stress during this period, the lower the total yield.

Stress during Period III is not strongly correlated with yield or quality, although some effects probably occur.

It is normal to see an increase of 1-2 stress units after a flood irrigation, expecially in heavy soils. As drainage occurs, there is a rapid decrease in the index. The index then remains low for a period of time, then gradually increases until the next irrigation or rainfall.

Data should be analyzed in two ways: (1) Overall averages and, (2) Daily readings. Daily readings should not exceed 2.0 between June and mid-August. The average of all daily readings should be less than 1.0 for the same period.

In general, the cooler potatoes remain (the lower the stress index), the higher the yields and the better the quality.

Remember, factors other than soil moisture also affect yield and quality (variety, fertility, and unusual weather events, to name a few). Proper use of the Scheduler will insure that yield/quality losses due to over- or under-irrigation do not occur.

FIX IT RIGHT FIX IT *FAST*

by: C. T. Scholl, Product Manager

Should your Scheduler® Plant Stress Monitor ever need service, our policy is to fix it right and fix it fast. The day we receive your Scheduler at our lab, a Customer Service Representative will telephone you to verify the reason for return. At that time the representative will tell you the date it will be shipped to you via UPS Blue (second day delivery).

Our lab personnel are the best in the business. They have not only repaired Schedulers for several years, but were the people instrumental in creating this innovative device. They estimate that any problem can be fixed within three days, most problems can be solved the same day. You can be sure that whatever problem should arise with your Scheduler, our lab personnel can solve it!

The Scheduler is No. 1 because it is the first plant stress monitor of its kind. Providing you with the best service available and sticking to our service policy are ways we'll always be on top!

WANT TO ORDER?

by: J. K. Riley, Marketing Manager

No Problem! It's as simple as picking up the phone. Call (800) 356-0458, and ask for Lynn. She will help you decide which model (Production or R&D/Consultant) will fit your needs and will program your Scheduler® Plant Stress Monitor with the crops you want. Just remember, to be assured a Scheduler for this cropping season, order now, as we cannot guarantee what the inventory levels will be during peak periods.

Call Us: IT'S FREE!

(800) 356-0458

PLANTS BEHAVIOR

(continued from page 1)

a measuring scale for accurate readings of crop health. With the plant stress index, growers can easily determine when a plant is not transpiring at its full potential.

The Scheduler was designed to measure the plant in its environment above the ground and to equate that information to the plant's requirements below the ground. The Scheduler measures leaf temperature and the field's environment to compute the plant stress index based on these measurements.

SCHEDULER SHOWCASE

The Scheduler® Plant Stress Monitor will be on display and demonstrated at the following shows coming up soon:

May 12 California State University, Fresno. *Sensors and Techniques for Irrigation Management* sponsored by The Center for Irrigation Technology.

May 14-15 University of California, Riverside. Jojoba Growers Association Meeting.

June 22-24 Bally's Hotel, Reno, Nevada. American Society for Enology and Viticulture 39th Annual Meeting.

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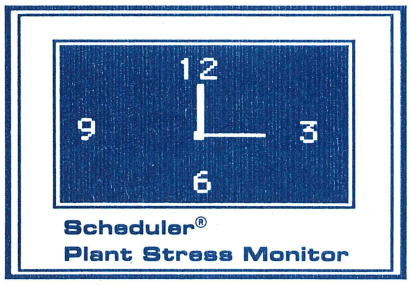
A STICH IN TIME SAVES . . .

by: S. C. DeSutter, Manager

If the saying is really true, "Time is money," then we could all be bankrupt. There never seems to be enough time to go around when the peak growing season hits.

Several times growers have asked me, "Will the Scheduler® Plant Stress Monitor take too much time to use?" In sixteen years of production experience, I have noticed that the activities that consume the greatest amount of time are the unplanned and unexpected emergencies. You could probably develop your own list of favorite emergencies that seem to just "happen" every year and always at the wrong time. TIME, oh yes, we're talking about time and that's an area where the Scheduler really helps. Here's how:

• **EVERY FIELD** has a two-week record built into the Scheduler's memory for on-the-spot decisions about irrigation. That means less time spent shuffling through piles of records.



• **FAST:** As quickly as you can stop your pick-up and walk into the field (orchard or vineyard) you'll have instant stress information on literally hundreds of thousands of plants. The result, you can catch a surprise before it happens to you and irrigate before the unwanted stress occurs.

• **ACCURATE:** One of the best ways to save time is to make the right decision the first time. When the peak irrigation season hits, irrigating the right field at the right time is the only way to go. The Scheduler let's you review each field's history fast so irrigators are running water where it is needed most.

"Take too much time to use?" NO, the Scheduler was designed to operate as your companion, an extra set of eyes alerting you to unexpected field problems before they steal your time and money.

HOT CROPS FOR '88

by: L. P. Bucknell, Sr. Sales Correspondent

By now you are familiar with the Scheduler® Plant Stress Monitor, which measures leaf temperature and the environmental factors influencing that temperature (air temperature, relative humidity, and the intensity of the sunlight). These measurements collected by the sensor gun go to a shoulder-pack computer for an instant calculation of plant stress in the field. Growers like yourself obtain a complete and accurate picture of plant health. The Scheduler gives you the needed information with which to base your irrigation and crop management decisions.

You're probably wondering if the crops available are the same as the crops you grow. Here is the list of available crops for the 1988 growing season:

Alfalfa, Almonds, Asparagus, Barley, Carrots, Cantaloupes, Corn, Cotton, Cucumbers, Grain Sorghum, Grapes, Jojoba, Oranges, Pecans, Potatoes, Sugar Beets, Soybeans, Tomatoes, Turfgrass, Watermelon, and **Wheat.**

Also available are two generic baselines labled **HIGH** and **LOW** to be used for crops for which we have not yet developed baselines.

In a constant effort to be of service to you we are updating the list every year. New crops to be added soon include:

Apples, Broccoli, Cauliflower, Lettuce, Nectarines, Peaches, Pears, Plums, and **Strawberries.**

We'll keep you advised.

THE AWARD WINNING SCHEDULER® PLANT STRESS MONITOR

The Scheduler® Plant Stress Monitor, selected as one of the "worthwhile contributions to the advancement of engineering in agriculture" by the American Society of Agriculture Engineeres. Call for a demonstration (800) 356-0458.

The Agricultural Engineering 50

PRACTICAL FOR THE GROWER . . . *ABSOLUTELY!*

(continued from page 1)

crops with the Scheduler in 1988, "In a nutshell," says Krauter, "it's simple, takes less calibration time, and is quicker and more efficient than anything else I know. Those things alone should give any grower an upper hand in time and cost savings. I can see the Scheduler becoming established as a valuable tool with widespread applications on a variety of crops."

by: Dr. B. R. Gardner, Technical Manager

What should the index be for the first irrigation on cotton?

That depends on your soil type. On sandy and salty soils, the first irrigation may be needed in May. The plants may be only 4-6 inches tall at this point. Small plants are difficult to sample, since soil temperature can easily cause highly variable readings. Irrigate plants this size when the average index of 30 samples exceeds 7.0. On heavier soils, plants may not need a first irrigation until June. By this time they may be up to 2 feet tall. Plants this size can be sampled easily without soil effects. Irrigate when the index exceeds 3.0

How early can I use the Scheduler on my potatoes?

You can begin sampling when the plants are six inches wide. You will need to be very careful to avoid the soil, a major cause of variability in the readings. Aim at plants which are 2-3 feet in front of you which have grown together into a tight grouping so that soil cannot be seen between the leaves. Irrigate when average index exceeds 2.0.

Can the Scheduler be used on any plant?

The answer is no. There are two basic requirements for using the Scheduler on a plant:

(1) The plant must have sufficient leaf area so that solid grouping of sunlit leaves can be sampled (no shadows, soil, wood, or sky should be visible between the sampled leaves), and (2) The plant should transpire at a reasonably high rate so that evaporative cooling of the leaves occurs. When water stress occurs, the leaves will then become hotter than normal during mid-day.

If these two conditions can be met, the Scheduler can be calibrated for use on that plant.

Does soil temperature affect the index?

It might. Plant roots cease to function as they become cold. In the spring, cold soil temperatures may inhibit the ability of roots to absorb water. If the daytime conditions are hot and dry (but the soil is cool) plants may exhibit stress symptoms in spite of the fact sufficient moisture is available in the soil.

Do you have published guidelines for my specific crop?

Yes. We have put together specific details tailor-made for each crop. These articles are known as *Scheduler Know How* and are written with the grower in mind. Guidelines are available for the following crops: TOMATOES, SUGAR BEETS, WATERMELON, CORN, SEED ALFALFA, FORAGE ALFALFA, GRAPES, COTTON, JOJOBA, POTATOES and ALMONDS. For *FREE* copies, write. List the crops you grow and let us know how we can make you an expert Scheduler user.

Dr. Bronson Gardner, Product Technical Manager, is ready to answer your specific crop related questions. Dr. G is one of the inventors of the Scheduler® Plant Stress Monitor. He was the first scientist to use the Crop Water Stress index to schedule irrigations on commercial fields. Write Dr. G., Standard Oil Engineered Materials Co., Sensor Technologies, P.O. Box 391316, Solon, OH 44139. Dr. G will answer your questions in each edition of Technology Times.

Standard Oil
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Solon, OH 44139

SHOOT DOWN IRRIGATION PROBLEMS...

Look Inside For More Information►

TECHNOLOGY TIMES

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Volume I Issue III September, 1988

HI TECH FARMING CUTS WATER COSTS BY 50%

Simpson Vineyards located in Fresno County, California, is an aggressive adaptor of the latest technologies for the production of raisins and almonds. Owner-manager, Lee Simpson, has turned farm management into an efficient and accurate process. From his office, Lee can make precise applications of fertilizers or control his irrigation system with the stroke of a computer key. In less than 10 minutes he can monitor every field in his farm via a computerized drip irrigation system.

Simpson's underground drip irrigation system reduces many of the problems associated with flood irrigation such as weed control and over-irrigation. Lee says, "Irrigation management has helped me realize a 50% savings in water as well as cutting down my power bill by 30%." But computers alone didn't solve the problems. Lee also uses soil probes and tensiometers to give him moisture contents at depths of 24 and 48 inches to verify his irrigation management decisions.

This year Lee bought a Scheduler, a plant stress monitor that utilizes infrared technology to provide plant status information. The Scheduler calculates the stress level of the crop through a self-contained program based upon the direct temperature measurement of the plant. He then plugs the Scheduler into his computer and downloads the results for analysis and decision making. This information helps him fine tune his irrigation for maximum efficiency. Lee states, "Stress can be caused by lack of water, nutrient deficiency, or by insect damage. If we discover the vines are under stress, we have to determine why and correct the situation."

Lee's field agronomist Nanette Simonian, collects plant stress information for the ranch. Nanette advises, "It's very important that the monitoring be done with full sunlight behind your back and at the right time of day. Only sunlit canopy should be sampled and enough randomized samples should be taken for good field representation." Because stress can occur for various reasons, it is Nanette's job to determine why there is stress and correct the situation. In addition, Nanette's experience

(continued on page 2)

.....A GOOD FIT.....

In the Columbia Basin chances are agriculturalists have run across Dale Bowers of Sargent Pump and Irrigation based in Othello, Washington. Bowers, an experienced salesman, works exclusively with the Scheduler. Bowers says, "I've been in sales all my life and have never sold a product that has been so much fun as well as rewarding. It is a tool that everyone is receptive to."

"We have a variety of users in our area including several growers, chemical and fertilizer dealers and scheduling services. All of our user groups feel the product is helping them to accomplish their management objectives. For example, the growers are using the Scheduler to help fine tune their water management practices. Chemical and fertilizer dealership fieldmen are using the tool as a time saver." Bowers states, "Time is money and whenever you can walk into a field and accurately look at several acres in just seconds, you have an advantage." Early detection of hot spots in a high value crop such as potatoes can be worth a lot of money. Scheduling services are using the instrument as an add-on to their current methods, helping to fill gaps between soil moisture monitoring and plant based measurement."

Bowers says, "Overall, this technology is one of the most exciting things I've seen in years. I can see a variety of practical uses for the Scheduler." Dale is looking forward to the 1989 growing season as a time when more growers and fieldmen will find the Scheduler a real asset to their business.

KEEP IT CLEAN

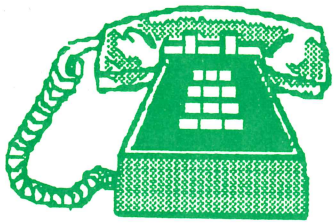
The Scheduler® Plant Stress Monitor was designed for outdoor use, but it is a complex electronic instrument and care must be exercised in its use and maintenance if you are to have trouble-free service.

The microprocessor and the gun housing can be wiped clean with a soft, damp cloth and a mild detergent solution. Take care not to get any moisture into the internal workings of the instrument or the sensor gun. The most critical component of the unit to keep clean at all times is the lens of the infrared thermometer. If the lens in the nose of the sensor gun (covering the infrared thermometer) needs cleaning, use a cotton swab wetted with ethanol. Any alcohol used for this purpose must not have denaturing additives--these will leave a residue. Remove minor accumulations of dust with a soft bristle brush.

The window protecting the solar radiation sensor at the rear of the gun can be cleaned with lens paper or a camel's hair brush (available at photography or art stores). More stubborn debris can be wiped off with a slightly dampened cloth and mild detergent. Again, take care not to get any water into the sensor gun.

That's right, keep it clean to assure yourself of accurate readings.

Call us:
IT'S FREE!



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COTTON TERMINATION

ANOTHER APPLICATION FOR INFRARED TECHNOLOGY?

"Judgment of field situations is a complex process since there may be 50,000 to 300,000 immature bolls per acre on plants of varying types and unknown root distribution," states Charles Farr, State Extension Agent based in Phoenix, Arizona. "Chuck" has spent a great deal of time conducting termination trials looking for better and easier ways for growers to assess cotton's response to "fruit load," changing soil conditions, and unpredictable weather patterns.

In his 1988 field trials Chuck has focused on the use of infrared and direct plant temperature measurements to assess plant stress for determining different irrigation termination dates. His goal is "to establish guidelines for the farmer using infrared technology." He is quick to point out, "This technique is very encouraging since it can potentially overcome the limitations of site-specific soil moisture measurement."

Encouraged by his early results, Farr has also included the Scheduler® Plant Stress Monitor in his 1988 defoliation plots as a tool to assess proper application of defoliants.

Keep up the good work, Chuck, we are all anxious to hear the final results!

TECH FARMING

(continued from page 1)

with the Scheduler is helping her quantify stress levels at harvest. "When we collect enough data, we should be able to use the Scheduler to help us determine how to minimize harvest stress and also optimize the timing of picking or shaking with a quick squeeze of the trigger," says Simonian.

Because he strives for better farm management practices, Lee Simpson knows he has to reach out for best quality and productivity and the Scheduler is helping him meet that objective.

Scheduler® Plant Stress Monitor

Technology Times, *Editorial Contributors:*
Steve DeSutter, Manager
Chuck Scholl, Product Manager
Dr. Bronson Gardner, Technical Manager
Korbin Riley, Marketing Manager
Lynn Bucknell, Sales Correspondent

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Address all requests to:
Editor, Technology Times
P. O. Box 391316
Solon, Ohio 44139

INTRODUCING ► **Croplink™**
Crop Monitoring Systems

Standard Oil Engineered Materials introduces CROPLINK Crop Monitoring System. Croplink gives a crop manager the professional edge he needs, it gathers and measures vital plant and field information when and where you need it--in your fields, 24 hours a day.

THE CROPLINK ADVANTAGE

All the information in the world doesn't amount to much if you can't put it to use producing a higher yield, and that's the Croplink advantage. Croplink is a complete monitoring system; a hardware and software package that collects interprets, and transmits data to a PC at your farm office. Best of all, the Croplink station and system can be added on to any existing compatible PC installation.

Frost Warning
Plant Stress
Evapotranspiration
Irrigation Scheduling

THE BEST CROP MANAGER CAN BECOME EVEN BETTER

Here, in one system, is all the information you'll ever need for superior crop management. The self-contained Croplink field station continuously monitors air temperature, relative humidity, wind conditions, and plant water stress. The information is transferred by infrared telemetry at distances of up to a mile to your central control station (farm office). The result is an ongoing profile of actual plant conditions, allowing the crop manager to:

- **Make watering decisions based on actual crop needs**
- **Cut irrigation costs and still maintain maximum yields**

FULL FEATURED AND ADAPTABLE TO YOUR OPERATION

- **Infrared Telemetry**
- **Remote Controlled**
- **Wireless (Lightning Safe)**
- **Custom Software**
- **Compatible with Virtually Any Irrigation System**

INFRARED "SAFE AND RELIABLE"

Unlike many other weatherstations, the Croplink field station operates on the infrared data link system The advantages of infrared telemetry are:

- **Rugged, low maintenance**
- **Wireless, lightning safe**
- **Unaffected by radio interference**
- **No license necessary**

MANAGEMENT INFORMATION

Traditionally weatherstations report stacks upon stacks of weather status reports. Croplink is different. Croplink reports and graphically displays real time and historic information of ET, crop water stress index, minimum and maximum readings for air temperature and humidity, and much, much more. In addition, several Croplink stations can be linked together at up to one mile increments throughout your farm. If farming is your business, then take a look at the Croplink system. It is the latest tool in crop monitoring from the leaders in the field.

Send me more info on ***Croplink!***

Name_____
Address_____
City_____
State _____ Zip _____
Phone (____) _____

Standard Oil Engineered Materials Co.
Sensor Technologies
P. O. Box 391316
Solon, OH 44139
(800) 356-0458

Ask Dr. G.

What is required to take accurate plant temperature measurements?

Instruments which measure canopy leaf temperature should fulfill four basic requirements: (1) The canopy should not be disturbed, (2) The real temperature of the canopy should be measured with sufficient accuracy, (3) It must be possible to take repeated readings with the instrument, and (4) The instrument should be transportable and sturdy enough for use in the field. The use of infrared thermometry by the Scheduler® Plant Stress Monitor insures that the plant canopy is not physically disturbed. Advanced engineering insures that the Scheduler is technically accurate. The design of the Scheduler makes it portable and easy to operate, allowing a user to repeatedly sample a single-site rapidly, store the results and continue for many additional locations.

Can I get some help understanding my data?

Definitely. Just copy your data onto a 5 1/4 inch disk and send it to me. I would be pleased to examine it and answer any questions you may have about it.

How does the Scheduler fit in with other tools for soil monitoring such as the neutron probe, tensiometers and gypsum blocks?

The fit depends on your application. These other tools are designed to directly measure how much moisture is in the soil. Crop stress is not measured by these tools. The Scheduler directly measures crop stress, but does not measure soil moisture. The most effective fit is a combination of the Scheduler (when to irrigate) with soil moisture (how much to irrigate).

Address your questions to:

Dr. G
P. O. Box 391316
Solon, OH 44139

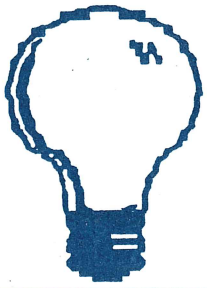
Dr. G answers your questions in each edition of Technology Times.

PACIFIC GAS AND ELECTRIC OFFERS ENERGY CONSERVATION REBATES ON SCHEDULER

Pacific Gas and Electric in Fresno, California, offers rebates of up to 40 percent for instruments such as the Scheduler® Plant Stress Monitor when energy conservation can be demonstrated. Growers must show proof of savings to qualify for one of the two programs available:

Advance Technology Rebate
or the
Customized Rebate

Check with Pacific Gas and Electric to see if you qualify. There may be some additional savings out there for you!



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Sensor Technologies
P. O. Box 391316
Solon, OH 44139

SHOOT DOWN IRRIGATION PROBLEMS...

LOOK INSIDE FOR MORE INFORMATION

TECHNOLOGY TIMES

A newsletter published by **The Carborundum Company** *for those interested in the most innovative products for maximum crop yields.*

Volume II Issue I **January, 1989**

CROPLINK . . . NOT JUST ANOTHER WEATHERSTATION

Remember when the only people concerned with gathering weather data were the national or local weather forecasters? In the past the grower had to rely on this weather system to get valuable information to make crop management decisions on the farm. Now modern technology in the farming community lessens the dependence of today's grower on outside sources for critical crop management information. Advanced technology has made it possible for the modern grower to purchase weatherstations to collect important data at a specific location and at relatively low cost.

In 1988, The Carborundum Company, formerly Standard Oil Engineered Materials Company, introduced the Croplink™ Crop Monitoring System, a sophisticated yet practical weather monitoring system. Croplink, as the name implies, links the farm manager to his crop.

Since weatherstation technology is not new, the questions could be asked:

- *What makes the Croplink system different?*
- *What does Croplink have to offer that other weatherstation manufacturers can't provide?*

The Croplink advantage begins with two features not presently found in conventional systems. Through the use of the most advanced infrared technology, Croplink provides infrared telemetry to transmit data and infrared thermometry to determine crop stress. The infrared telemetry transmits valuable information from the field station to a base station (home or office) without the use of wires or telephone lines. Infrared telemetry does not require licensing and since there are no wires to contend with, the field station can be conveniently moved from location to location. This mode of transmission also lends itself to a future expansion of the grower's weatherstation system.

By incorporating infrared sensors at the field station site, the Croplink system can provide the grower with valuable crop stress information. In addition, Croplink provides up-to-date ET information by calculating cumulative ETs for a specific crop.

The Croplink™ Crop Monitoring System

With both ET and crop stress data the farm manager has more information to make those important decisions regarding irrigation scheduling and crop maintenance.

(Continued on page 2)

SCHEDULER CONFIRMS GROWERS IDEAS

Bill Zimmerman, farm manager for Tellis Ranch in Firebaugh, California, wears several hats. Bill is the man responsible for the fertilizer and pesticide programs and the irrigation scheduling program. No small job considering the ranch location consists of 6,000 acres of cotton, sugar beets, and wheat. With 35 years of agricultural experience, Bill has excellent qualifications.

During his 15 year tenure at Tellis Ranch Bill says, "I've seen a lot of changes in farming over the years and we continue to look for ways to operate more efficiently. That's why we invested in a Scheduler® Plant Stress Monitor. It's easy to use and much quicker than some other methods we have tried." Before using the Scheduler Bill used the pressure bomb to investigate the moisture content of the soil. The Scheduler, on the other hand, measures moisture content of the plants themselves thereby giving the farm manager knowledge of how the plants are using the available soil moisture. To obtain this valuable information Bill says, "One just aims at the crop, pulls the trigger, and the monitor calculates the plant stress level for you. Anyone could use it and I recommend the Scheduler to any grower since it can be used on so many different crops."

Even with years of in-field experience, Bill says, "It is nice to be able to confirm what you are thinking or just know about a particular field situation a little bit earlier than usual. Since using the Scheduler, I believe we have decreased our water usage while our average yields have

CROPLINK

(Continued from page 1)

A weatherstation can be a valuable tool only if the data is in a pracitical format. Most conventional systems either provide mounds of useless complex data or make data retrieval slow and time consuming. With Croplink software the farm manager is provided with real time and historical data at the base station in a user friendly format. Software flexibility allows the operator to program the field station at the computer keyboard as well as dedicate to memory only the data desired. Cumulative ET and crop stress are automatically calculated and reports are printed automatically and on an as-needed basis.

The Croplink monitoring system further provides frost warnings for critical conditions during cold spells as well as pest management applications. The sensor package makes possible vital information to measure any combination of environmental parameters that impact the crop.

High technology on the modern farm is here to stay. The Croplink weatherstation is a valuable tool for the farm manager that requires more information for those critical decisions. If you're looking for a crop monitoring system that provides practical crop and field information, then take a look at what the Croplink advantage can do for you. For more information on Croplink telephone us toll free (800) 356-0458 or fill in and mail the coupon below to Croplink™ Crop Monitoring System, The Carborundum Company, P. O. Box 391377, Solon, OH 44139

Send me information on **Croplink**

Name _____

Address _____

City _____

State _____ Zip _____

Telephone _____

The Carborundum Company
P. O. Box 391377
Solon, Ohio 44139
(800) 356-0458

AT YOUR SERVICE

Do you ever get frustrated trying to buy a new product from someone who knows less about the product then you do?

Providing knowledgeable, capable distributors for product demonstration and post sale service is our number one goal. This winter each of our distributors has been asked to attend a week long product training school held in cooperation with California State University and the Center for Irrigation Technology.

Our goal is to provide the distributors with the latest information on our products to best serve you, our customer. It won't be easy. This week long course is designed to cover a large area of product applications in depth. In fact, it has received university as well as PCA accreditation. It is designed to cover plant physiology, the crop water stress index, how to design a farm use program, and key sales and service skills to help the distributors put it all together. The January seminar will be the most extensive training school held by the company. It is expected to be attended by the majority of our United States and internationally based distributors.

We are proud of our distributors who are taking the time to challenge their minds and improve their service to you!

Using the Plant Stress Index to reach targarted yields

OUT-OF-SIGHT OUT-OF-MIND

Many of you have ended or are near the end of your cropping season and it is time to store your Scheduler® Plant Stress Monitor for the winter. To insure you will be trouble free and ready to go next spring, we offer the following helpful hints:

- *Do not store the instrument in an unheated room or shed. Freezing temperatures over time can damage the monitor.*
- *Remove the batteries if you will not be using the monitor for an extended period of time. This avoids any possible damage from leaking corrosives.*
- *Store the instrument in its carrying case away from any excessive moisture.*

Next spring simply add new batteries and shoot down irrigation problems!

Scheduler™
Plant Stress Monitor

SCHEDULER CONFIRMS

(Continued from page 1)

gone up."

Quick to show enthusiasm for the Scheduler, Bill says he plans to use the monitor extensively during the 1989 growing season.

WELCOME BACK, CARBORUNDUM

September 6, 1988...
It's a day we'll always remember. That's the day when Standard Oil Engineered Materials once again became **The Carborundum Company,** officially bringing back the name by which our company has been known for 92 of our 97 years in business.

"Our reputation as a world leader in advanced ceramic materials was earned under the Carborundum name," said company president, Luiz F. Kahl. "Since 1891, Carborundum has been synonymous with innovative technology, superior service and unsurpassed technical ability. As our company continues to focus on technological breakthroughs in new advanced ceramic materials, we feel that it is important to have that reputation behind us as we approach today's high-tech markets."

"Our parent company, BP (British Petroleum), which acquired Engineered Materials along with Standard Oil in 1987, supports the name change," he continued. "We are very pleased with the encouragement that BP is giving us as we re-establish The Carborundum Company identity."

"In addition to having a well-known identity in the marketplace, the support of BP also affords us the resources and backup of one of the world's largest corporations, assuring that we maintain and strengthen our position in the market.

CARBORUNDUM *TODAY*

Under the leadership of company president, Luiz F. Kahl, Carborundum currently employs an international work force of 5,200 dedicated individuals. Our worldwide sales in 1988 are projected to be $375 million. We can be found in 39 locations across the globe, operating manufacturing facilities throughout North America and in Brazil, Germany, England and Australia to serve both our domestic and international markets. Overall estimated spending on research and development in 1988 will be over $20 million.

Carborundum products span many industries requiring materials that are resistant to extreme temperature, thermal shock, impact, abrasion, corrosion and other demands of industrial processes and applications. Some of the major business operation units include: Structural and Electronic Ceramics as well as the group you are familiar with *Instrument Technologies*, which manufactures the portable computerized Scheduler® Plant Stress Monitor and the Croplink™ Crop Monitoring System, both of which calculate plant stress as a timely and accurate indicator of when to irrigate crops and help detect disease long before any physical symptoms can be detected by the human eye.

USER TRAINING SCHOOLS . . . PLANS TO BE ANNOUNCED . . .

Throughout 1989 we plan to conduct several training schools for our product users. You will be notified through Technology Times newsletter and special mailings on specific dates and locations in your area. If you are interested in a specific area of training, feel free to share your ideas by calling our office and speak to Lynn Bucknell, the editor of Technology Times, toll free (800) 356-0458. To make sure your are on the mailing list, please fill out the coupon next to this article.

Please let me know when and where the User Schools will be held:

Name _____

Address _____

City _____

State _____ Zip _____

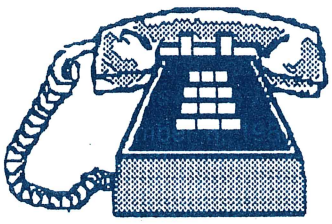
Telephone _____

Special area of interest:

_____

_____

Call Us:
IT'S FREE!



(800) 356-0458

Technology Times, the forum of **The Carborundum Company.**

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The New Generation of Irrigation and Crop Management Technology

• Does the Scheduler fit into my picture (160 acres of wine grapes near Bakersfield, CA)?

Yes. You stated you have 160 acres of wine grapes. Your decision to buy a Scheduler® Plant Stress Monitor needs to be based on how carefully you wish to manage these vines and control costs, and even more importantly, grape quality. The Scheduler is a valuable tool for adjusting an irrigation system to accomplish two main goals:

(1) Maintain the uniformity of plant temperatures. This helps insure that unwanted yield and quality variations are not induced by unwanted moisture stress or over-irrigation.

(2) Avoid the costs associated with over-irrgation.

• Does the Scheduler require a personal computer?

No. We have many successful users who do not have a personal computer. The Scheduler keeps track of the information from 30 fields for a two-week period. We do have support software to assist personal computer owners in managing their field information. However, simple charts can be kept by hand if longer than a two week history is required.

• Can the Scheduler® Plant Stress Monitor be used to help apply PIX in cotton?

We were unable to answer that question this year. Three research sites (two in California and one in Arizona) conducted PIX/Scheduler trials. The results of the 1988 trials were inconclusive. We should have some answers after the 1989 growing season.

Address your questions to:

Dr. G.
P.O. Box 391377
Solon, OH 44139

Dr. G Answers your questions in each edition of Technology Times.

ANALYSIS SOFTWARE DEVELOPED

Software has been written for the Scheduler® Plant Stress Monitor to aid growers in downloading data from the unit to a computer and in interpreting it once it gets there. The program requires BASIC (GWBASIC or BASICA) and 256K of meory. It is a menu driven program with four main sections:

IMPORT: To import Scheduler files (data the unit reads from the field: relative humidity, air temperature, crop temperature, sunlight intensity and stress index) and save that data to a permanent file on your hard drive or floppy disk.

PRINT: To print today's Scheduler readings to the screen or a printer.

PATTERNS: To examine visually the temperature patterns measured. This allows the rapid identification of "hot spots" based strictly on plant temperatures.

GRAPH: Graphs today's data so the user can spot trends or unusual data points.

To order your copy of this software, send $400.00 (check or money order) to Analysis Software, P. O. Box 391377, Solon, OH 44139. It will be shipped immediately.

The Carborundum Company
Instrument Technologies
P. O. Box 391377
Solon, OH 44139

SHOOT DOWN IRRIGATION PROBLEMS. . .

LOOK INSIDE FOR MORE INFORMATION

TECHNOLOGY TIMES

A newsletter published by **The Carborundum Company** *for those interested in the most innovative products for maximum crop yields.*

Volume II Issue II May, 1989

EXPERIENCE + SCHEDULER = PERFORMANCE

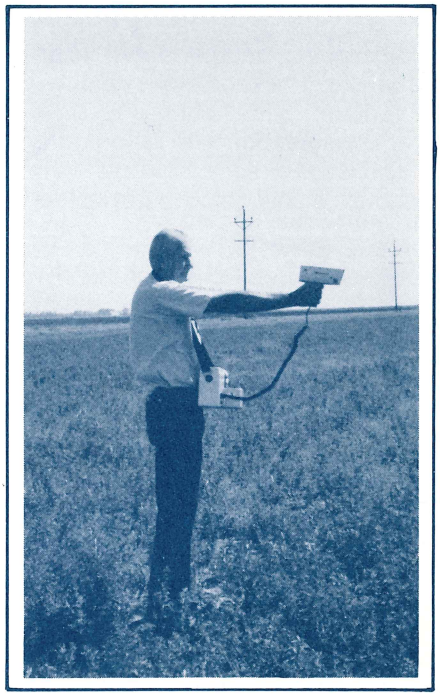
"Water management is the most critical issue facing the American farmer now and in the future," says Ed Dahlberg of Woodland, California. By using a tool like the Scheduler, a grower can decrease the cost of irrigation and learn to use the available water more efficiently," relates Dahlberg.

Ed Dahlberg, a licensed PCA and farm consultant at the Barber Rowland Company has been involved assisting growers with their farm needs for over 30 years. Ed purchased a Scheduler® Plant Stress Monitor two years ago and has used the unit extensively in crops like tomatoes, alfalfa, sugar beets, wheat and beans. Ed has been using the Scheduler directly with local growers and is impressed with the machine's capabilities. In addition to his job responsibilities as senior sales representative for Barber Rowland Company selling chemicals and fertilizers, Ed provides services such as water analysis and irrigation consulting, fertilizer recommendations and pest management. He has had plenty of opportunity to test the Scheduler's performance in these areas during the past two years.

"The larger growers should purchase and use their own Scheduler," says Dahlberg, "and the smaller growers should purchase a Scheduler jointly and pay a field man to manage it and take the readings." Ed reinforces his opinion by adding that the Scheduler takes about 30 minutes to learn to operate and comes with an instruction manual and crop guidelines to show the grower how to interpret the data.

Decreased irrigation costs, prevention of fertilizer leaching and early detection of insect infestations and plant disease are benefits Ed Dahlberg believes the Scheduler can provide to the grower. Ed has used the stress monitor in conjunction with local growers extensively using it on tomatoes, sugar beets and alfalfa much like a grower would use the Scheduler himself. On tomatoes he has used the Scheduler to monitor stress to find ways to increase solids.

"By cutting down on irrigation for crops like alfalfa and tomatoes, the grower could effectively decrease diseases like Phytothera to increase yields," explains Dahlberg. On sugar beets, Ed worked with a local grower scheduling irrigations on a 200 acre



crop and claims the Scheduler eliminated two irrigations.

According to Ed the key to making a

(Continued on page 3)

WEATHERSTATIONS . . . A PRACTICAL FARM TOOL?

As the sun slowly rises on the farm a silhouette begins to appear in the field resembling a cluttered TV antenna. It's a weatherstation and more and more of them are appearing on farms every year.

The layman might ask,"Why would a grower need such a technical contraption and is it really necessary?" The answer is that many growers are not satisfied with general weather information gathered by an instrument several miles from their own unique climate. Since much of the information from weatherstations is used for critical irrigation scheduling and frost protection, the modern grower needs information specific for his farm location.

In 1988, the Instrument Technologies group of The Carborundum Company introduced the Croplink™ Crop Monitoring System as a total weatherstation system for gathering valuable plant and environmental information on the farm. The Croplink brings practicality, affordability, and accuracy to on-farm monitoring.

Croplink also brings new features to weatherstation technology such as infrared sensors to detect plant stress and an infrared data link from field station to base station. Through the use of infrared sensors on the field station, Croplink has the capability of monitoring the plant directly for water stress. This provides the grower with more information to make those timely irrigation scheduling decisions. The infrared data link enables the grower to receive field information such as cumulative ET, actual crop stress status, and frost data.

A weatherstation can be called practical only if the infor-

(Continued on page 3)

SCHEDULING WITH WATER

NO WAY

Unfortunately, this statement is becoming all to common. Seems like you can't pick up anything to read without seeing another water shortage article. The problem is what we are reading and hearing is true. Water conservation and rationing is a critical issue directly affecting many of us and it's only going to get worse.

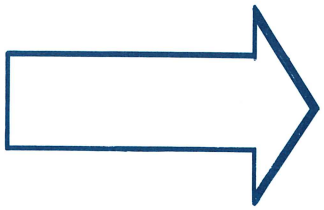
Several growers have mentioned that the Scheduler® Plant Stress Monitor would be great for those lucky enough to be in an area with an unlimited water supply. But, what about those areas where you have to order your water several days in advance or maybe have the option of only getting water every 10, 15, or 20 days throughout the season. A grower might ask "How can I use a Scheduler when my scheduling is already done for me?"

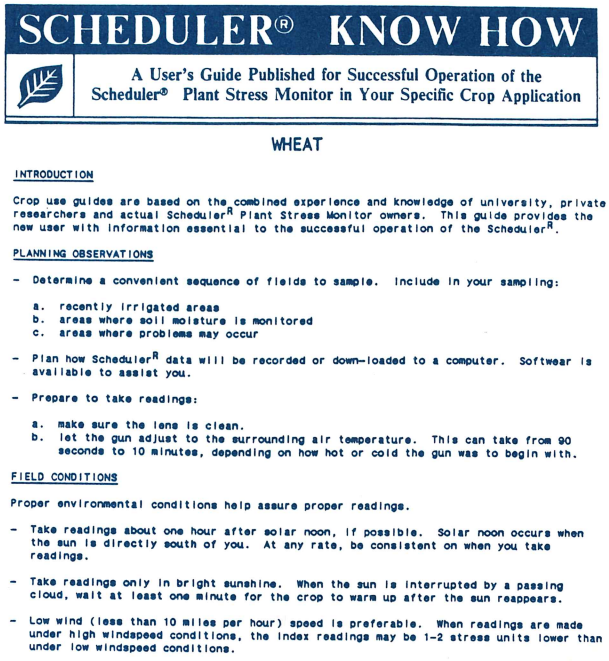
It might not be as tough as you think. One of the advantages of the Scheduler is being able to track plant stress levels over time. This is done by detecting very small changes in the plant's behavior several days before any damaging stress takes place. Watching the trends in a particular field helps a grower to accurately pinpoint what day to actually order water on. In addition, if a grower has several fields with limited water, he can prioritize and be absolutely sure he is putting it on the field that needs it the most.

On the other hand, if you're a grower getting water on a fixed schedule, say every 7 or 14 days, the Scheduler still has the same advantages, plus you can determine which schedule is best for that particular field based on what the plant is telling you.

No, there are no shortcuts, but products like the Scheduler® Plant Stress Monitor can help you make the most of a difficult situation.

WATCH OUT, KNOW HOW





SCHEDULER® KNOW HOW

A User's Guide Published for Successful Operation of the Scheduler® Plant Stress Monitor in Your Specific Crop Application

WHEAT

INTRODUCTION

Crop use guides are based on the combined experience and knowledge of university, private researchers and actual Scheduler® Plant Stress Monitor owners. This guide provides the new user with information essential to the successful operation of the Scheduler®.

PLANNING OBSERVATIONS

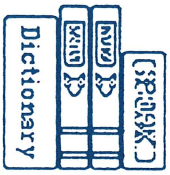
- Determine a convenient sequence of fields to sample. Include in your sampling:
  a. recently irrigated areas
  b. areas where soil moisture is monitored
  c. areas where problems may occur
- Plan how Scheduler® data will be recorded or down-loaded to a computer. Softwear is available to assist you.
- Prepare to take readings:
  a. make sure the lens is clean.
  b. let the gun adjust to the surrounding air temperature. This can take from 90 seconds to 10 minutes, depending on how hot or cold the gun was to begin with.

FIELD CONDITIONS

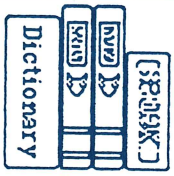
Proper environmental conditions help assure proper readings.

- Take readings about one hour after solar noon, if possible. Solar noon occurs when the sun is directly south of you. At any rate, be consistent on when you take readings.
- Take readings only in bright sunshine. When the sun is interrupted by a passing cloud, wait at least one minute for the crop to warm up after the sun reappears.
- Low wind (less than 10 miles per hour) speed is preferable. When readings are made under high windspeed conditions, the index readings may be 1-2 stress units lower than under low windspeed conditions.

Know How bulletins, have you seen them? We are in the process of updating our "Know How" guideline bulletins. These crop specific application sheets provide guidelines for effective field use of the Scheduler® Plant Stress Monitor. All updated bulletins will be sent directly to each owner. Please watch for them and place them in your owners manual for your review during the growing season. If you haven't received yours or you don't know where you put them, please call us toll free (800) 356-0458. We'll rush another set to you right away.



EDUCATION - JOB ONE



Dealers gathered from all over the West Coast including two international agents coming from as far away as Santiago, Chile, to attend our annual Distribution Training School. We are quite proud of this group of independent dealers who at great expense of time and travel endured a grueling five-day product training course.

Training school topics were designed to both update the dealers in the latest advances in the Scheduler® Plant Stress Monitor technology and provide basic training on new products. It covered topics such as basic plant physiology, the stress index concept, and how to develop a farm use plan. Dealers were also introduced to the unique concepts employed by the new Croplink™ Crop Monitoring System.

Our hats off to these guys!

Helena Chemical
Hartford, CA
(209) 582-0291

CCT Corporation
Avondale, AZ
(602) 853-0077

Western Farm Service
Vernalis, CA

American Ag International
Pullman, WA
(509)334-4412

Lake Irrigation International
Bakersfield, CA
(805) 399-9131

IrriDrain
Salinas, CA
(408) 484-1808

Crop Care Services
Fresno, CA

Britz Fertilizer
Five Points, CA
(209) 864-3201

Golden State Irrigation
Stockton, CA
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Carl Spiva
Modesto, CA
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Agri-Tech
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(FAX) (562) 231-8969

Central Valley Farms
Waterford, CA
(209) 874-1654

The Water Works
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P & P Sales
Chico, CA
(916) 343-4714

APPLES ARE IN

Many of our readers from around the United States have been waiting to hear the news of the release of an apple model for the Scheduler® Plant Stress Monitor. Well, its here! After pouring through tons of plot results from research sites in both Arizona and Prosser, Washington, our finds are conclusive. The Scheduler is ready to take the guess work out of apple irrigation. Call us for details toll free at (800) 356-0458.

PLANS BEING MADE FOR OWNERS

Once again we're in the midst of conducting our annual series of Owner's Schools. These half-day training sessions are designed to serve as a refresher for experienced owners and to get new users off to a good start.

This year we already have plans made in three different locations. The dates and locations are:

May 2 Pasco, Washington
May 3 Modesto, California
May 4 Coalinga, California

Each of these sessions will start at 9:30 a.m. and end with lunch. Topics discussed include everything from proper field sampling techniques to communicating with a computer.

For more information on these or future training locations, call us toll free at (800) 356-0458.

PERFORMANCE

(Continued from Page 1)

tool like the Scheduler work for the grower is to use it consistently and follow the rules. "Read the information provided with the Scheduler and the grower can't miss." explains Dahlberg.

Ed comments that water management is the key to success for the grower. With irrigation and plant maintenance tools like the Scheduler, the grower can control his irrigations and manage more effectively.

A LITTLE RECOGNITION

Our hats off to California Polytechnic State University, San Luis Obispo who awarded us with a handsome plaque in recognition of our supportive efforts to their state-of-the-art irrigation education program. To Dr. Burt and the gang at CalPoly, a very hardy:

Thank you!

It was our pleasure!

Call Us:
IT'S FREE!

(800) 356-0458

WEATHERSTATIONS

(Continued from page1)

mation it provides is easily gathered so it can be directly applied. The Croplink system provides the grower only with information he needs and it does it automatically.

If you are interested in managing your operation more efficiently than ever while giving yourself more control, call us toll free (800) 356-0458 for more information on Croplink.

TECHNOLOGY TIMES
The Forum of The Carborundum Company
Editorial Contributors:
Steve DeSutter, Manager
Chuck Scholl, Product Manager
Bronson Gardner, Technical Manager
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Bill Maupin, Sales Representative
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GRAPE GROWER MAGAZINE

CSUF TESTING MOBILE, STATIONARY INFRARED GUNS

The infrared plant stress monitor is one of the newest irrigation weapons available to farmers. It determines stress by measuring the temperature of plant foliage. According to Charles F. Krauter, professor of irrigation science at California State University, Fresno, the infrared plant stress monitor has several advantages over other irrigation scheduling tools. "The big advantage of this is the combination of speed and accuracy," he said. "One person can collect as much information as ten people using tensiometers or neutron probes. With this, a grower can tell whether the plants are stressed in a matter of minutes."

CSUF's Center for Irrigation Technology (CIT) has been doing research for the past three years on the Scheduler® Plant Stress Monitor, an infrared plant stress monitor developed by The Carborundum Company (formerly Standard Oil Engineered Materials Company). The gun works under the theory that a leaf without stress will cool itself through evaporation and will have a lower temperature than the air around it.

The three inputs (air, humidity and leaf temperature) are assimilated by the Scheduler in seconds to give a stress index number ranging from zero to ten with zero denoting no stress. Krauter said a grower can be reasonably sure the vines are not stressed when a reading is below three.

A stationary version of the Scheduler is also being researched by the Center. It currently perches just above vine level in a Chenin Blanc vineyard on the CSUF campus, looking much like a mini-weatherstation. Four infrared sensors pointing in many different directions take readings from the surrounding vines. Leaf temperature readings, plus air temperature, humidity and current wind conditions are fed to a computer several hundred feet away via an infrared system that works much like a television remote control. New readings are transmitted every three and a half minutes.

How does the Scheduler® Plant Stress Monitor work with my neutron probe program?

Your neutron probe program provides an excellent source of information about how much water is in the soil at selected sites and at different depths. The Scheduler informs you when your plants are having difficulty extracting the available soil water. Used together, the neutron probe and the Scheduler provide you with a comprehensive picture of soil moisture and plant stress. This type of complimentary program answers both of your key irrigation questions, **when** and **how much** water to apply.

With what type of irrigation system will the Scheduler® Plant Stress Monitor work best?

The Scheduler works with all types of irrigation systems, although management objectives and the system limitations differ somewhat with each type of irrigation system. For example, with flood irrigation, the goal may be to keep plant stress below an upper limit during soil drying cycles. With drip irrigation, the goal may be to maintain a constant stress status or a particular stress value assuring an adequate and even supply of soil moisture avoiding the drying cycle peaks found in flood irrigation.

How does the Croplink™ Crop Monitoring System differ from common weather-stations?

Croplink differs in three areas:

1. **Infrared thermometry.** Croplink is the only weather-station that provides infrared thermometers for measuring plant temperature as a standard sensor. Crop temperature is essential information for plant management.
2. **Software.** The Croplink software is designed to provide management information, not a lot of numbers.
3. **Telemetry.** Croplink offers infrared telemetry in addition to radio hook-up. Infrared telemetry makes Croplink easy to set up, easy to move around the farm, and a cost effective way to have valuable management reports available 24 hours a day.

Address your questions to:

Dr. G
P. O. Box 391377
Solon, OH 44139

Dr. G answers your questions in each edition of Technology Times.

SPECIAL ANNOUNCEMENT FROM DR. G

Send me a 5 1/4 inch diskette with your Scheduler® Plant Stress Monitor information, a written description of what crops were assigned to each field, and an indication of crop condition (high yields, normal, problem areas, etc.) and I will send you the following information:

1. Daily averages for each crop.
2. Daily summaries for each field.
3. Comments about anything unusual in your records.

FREE

The Carborundum Company
Instrument Technologies
P. O. Box 391377
Solon, OH 44139

SHOOT DOWN IRRIGATION PROBLEMS. . .

LOOK INSIDE FOR MORE INFORMATION

TECHNOLOGY TIMES

newsletter published by **The Carborundum Company** *for those interested in the most innovative products for maximum crop yields.*

Volume II **Issue III** **September, 1989**

GREATER PROFITS: MAKING TECHNOLOGY WORK

The San Joaquin Valley of California has long been known for it's rich farmland in producing a variety of many different kinds of crops. Nestled in the heart of this great valley near the town of Firebaugh is a ranch by the name of G2 Farms. The farm is owned and operated by John Garcia with cotton, dry beans, wheat and peas making up the main crops grown at G2.

John Garcia is a native of California who's father operated a dairy near Escalon. John has been involved in farming nearly all of his life. After graduating from Fresno State University, John managed several farms involved with many different crops before founding G2 Farms with his uncle in 1978.

"No two days are alike in a farming operation," comments Garcia. The challenges of having to deal with the weather, insects, regulations and people are all reasons John views farming as a highly diversified and interesting business. One of the challenges John has faced for several years is water management. "The management of water is probably the greatest factor in the achievement of higher yields and profitability," says John.

Because he is concerned with water management, Garcia has incorporated many tools at G2 to help him better schedule his irrigations, like the pressure bomb and neutron probe. In 1987 John purchased a Scheduler® Plant Stress Monitor after reading about the instrument in a farming magazine and then actually seeing the Scheduler used in the field by a local farmer that owned one. "The pressure bomb is a reliable tool but is time consuming and factors like air temperature are not calculated by the machine," explains Garcia. "With the Scheduler I can take several hundred or more samples in the same amount of time as the pressure bomb as well as obtain factors such as air temperature and humidity."

(Continued on page 3)

THE FUTURE IS HERE TODAY

Generally speaking, one does not consider a watherstation to be an integral part of a farming operation. However, with water management at the front of the most critical farm controversies, instruments to monitor irrigation scheduling such as weatherstations are becoming valuable on-the-farm tools to gather information for better management decision making.

At Hammond's Ranch in Firebaugh, California, field manager and agronomist, Bill Nicholas, interprets weather and crop data at his computer in his office. The computer is linked to his Croplink Crop Monitoring System through the use of infrared telemetry. "Instruments such as the Croplink weatherstation provide me with valuable information to eliminate the variables associated with water management," says Nicholas. "Croplink gives me evapotranspiration, crop stress and performs calculations such as growing degree days and wind run," comments Bill.

Having been involved in farming all of his life has made Bill Nicholas respect the laws that govern success in a farm business. "Water management is a critical issue in California,"

(Continued on page 2)

CROPLINK DID YOU CATCH IT?

Have you seen our new multi-colored foldout brochure on the Croplink™ Crop Monitoring System? It discusses the software, crop stress index, and other calculations. The information piece also illustrates the function of several of the different sensors including communication options. If you haven't seen it, no problem! Just give us a call toll free at (800) 356-0458 and ask for a copy of our new Croplink brochure or complete and mail the coupon below to The Carborundum Company, P.O. Box 391377, Solon, OH 44139. We'll be glad to send one to you immediately.

DID YOU KNOW HOW?

There is no problem knowing how with our *"Know Hows."* What is a Know How? They are quick reference one-page bulletins that provide specific sampling guidelines and management information on individual crops.

The bulletins have recently been updated to include the latest and most up-to-date pointers for effective field use of the Scheduler® Plant Stress Monitor.

If you have not yet received yours or would like extra copies, please give us a call toll free (800) 356-0458 or complete and mail the coupon below to The Carborundum Company, P. O. Box 391377, Solon, OH 44139 and we'll fix you right up.

Send me the following:

☐ **Croplink brochure**

☐ **( ) set(s) of Know Hows**

Name _____

Address _____

City _____

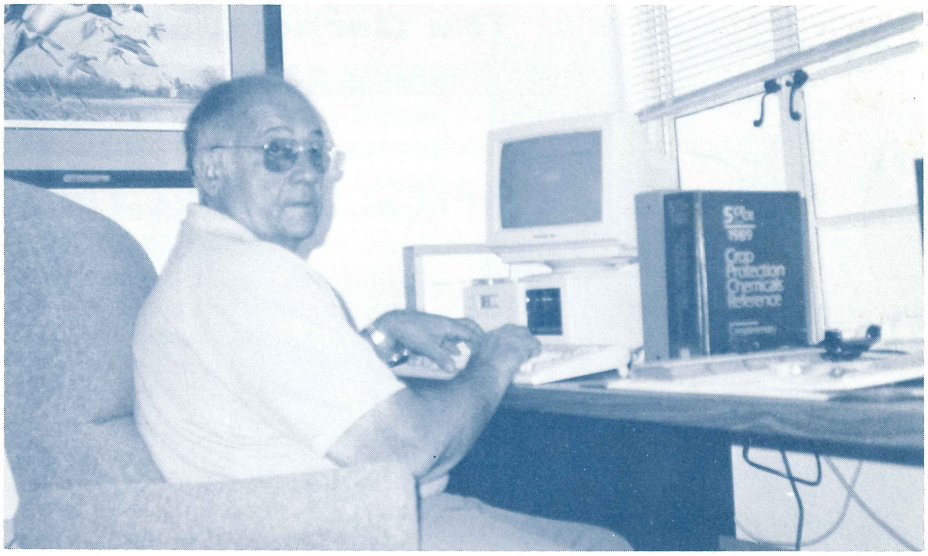
State _____ Zip _____

Telephone _____

The Carborundum Company
P.O. Box 391377
Solon, OH 44139
(800) 356-0458

THE FUTURE IS HERE TODAY

(Continued from page 1)



explains Nicholas. Bill further adds, "Farmers need to incorporate new technology into their farm practices to make their farms more water efficient." Along these lines Bill has used many tools to aid in his quest for better irrigation management; tools that include soil probes, tensiometers, and a Scheduler® Plant Stress Monitor. "I have had the Croplink weatherstation only two months and already have made irrigation scheduling decisions based on ET and crop stress information provided by the system," comments Nicholas.

According to Bill Nicholas, the one thing that sets Croplink apart from other weatherstations is the crop stress data gathered by the use of infrared thermometers at the field station site and automatically calculated by the software in the computer at the base station. "In addition to the valuable ET information, Croplink gives me plant-based information 24 hours a day," explains Nicholas. Bill further comments that the Croplink system is very cost effective. "I almost could not believe it when I heard the price of the Croplink system considering all the unit's features and capabilities," elaborates Nicholas.

In the past Bill gathered his ET information from the California Irrigation Management Information System or "CIMIS" as it is known. "CIMIS provides accurate information, however the data is gathered from many miles away," says Bill. "With Croplink, I can obtain the data provided by CIMIS as well as additional types of data and what's more, it's gathered right here at the farm location," Nicholas explains.

Sophisticated instrumentation like the Croplink weatherstation are no longer just for the researcher. "I believe farm managers will never be replaced by technology because the manager makes his decisions after physically checking his fields," says Bill. "Tools like the Croplink weatherstation simply help in the decision making process and make the manager more efficient," adds Nicholas.

IT'S ABOUT TIME

For many of you the season has wound down and you're ready to store your Scheduler® Plant Stress Monitor. Don't worry . . . it only takes an ounce of prevention now to assure a quick and successful start next spring.

Just remove the six C cell batteries (sometimes they leak) and place your Scheduler in a cool dry place. It is important to avoid temperature extremes, hot or cold, and store the unit zipped in its carrying case.

See . . . nothing to it!

GREATER PROFITS: MAKING TECHNOLOGY WORK

(Continued from page 1)

Like the irrigation tools he had used previously, John had to take the time necessary to incorporate the Scheduler into his farm program. "You have to invest some time to make it work. Buying it does not make you money because you have to apply it to your operation," comments Garcia. "The Scheduler is fast and easy to use and is about the only instrument you could hand to a field checker and expect the data to still be accurate and reliable," explains John.

Has the Scheduler made John Garcia and G2 Farms more profitable? "Saving water is good but it must figure into your bottom line. The Scheduler has helped me to make more efficient use of my water resources, and I actually do 80 percent of all my irrigation scheduling based on the Scheduler," comments Garcia. The Scheduler gives John Garcia peace-of-mind in knowing the plants have the right amount of water to produce the yields to make G2 Farms profitable. "I would recommend the Scheduler to any farmer concerned with water management," says Garcia. "I am fully satisfied that the money spent for a Scheduler has made me more efficient and profitable."

Products designed through advanced technology to make the farmer more profitable like the Scheduler are here now. With farmers like John Garcia at G2 Farms that have the dedication to make this technology work, new technology and profitability go hand-in-hand.

Scheduler™
Plant Stress Monitor

USERS UNITE

This year, due to the large number of Scheduler® Plant Stress Monitors in the field, we expanded and held a total of six User's Schools throughout the western United States. The schools consisted of a half-day classroom style training covering everything from a review of sampling guidelines to demonstrations of our latest software. The training seminars also gave some of agriculture's most innovative leaders an opportunity to compare notes on field monitoring programs and crop stress management practices.

A special thanks goes out to those users who dedicated their time to additional product training. Their presence was instrumental in making all the schools a success.

SHOW SUCCESS

The annual viticulture and enology show (ASEV) recently held in Anaheim, California, proved to be a great success. This was the third year we have exhibited and our best-to-date. In addition to representing the Scheduler® Plant Stress Monitor, we introduced the Croplink™ Crop Monitoring System to many viticulturalists for the first time.

The Scheduler, now a common tool in the vineyard, still created a lot of interest, but the attention the Croplink system received definitely exceeded our expectations. Bill Maupin, a Carborundum product specialist located in Stockton, California, says of the show, "We already had obtained good feedback from some of the innovative initial users of the Croplink weatherstation in grapes, but I was still surprised by the number of grape growers at the show asking for more localized and accurate crop and environmental information. They felt the Croplink system could provide many of the answers they have been looking for in fine tuning their daily management practices."

Throughout the next year, we plan to exhibit at several major agricultural trade shows. One show we'll be at for sure is the viticulture show. Hope to see you there!

Call Us:
IT'S FREE!

(800) 356-0458

TECHNOLOGY TIMES
The Forum of The Carborundum Company

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ASK DR. G

Address your questions to:

DR. G
P. O. Box 391377
Solon, OH 44139

Dr.G answers your questions in each edition of Technology Times

Is there more than one model of the Scheduler® Plant Stress Monitor?

There are two models currently available. One is designed for growers called the production model and the other is designed for consultant/research applications called the R&D model. The difference is in the storage and tracking of the readings.

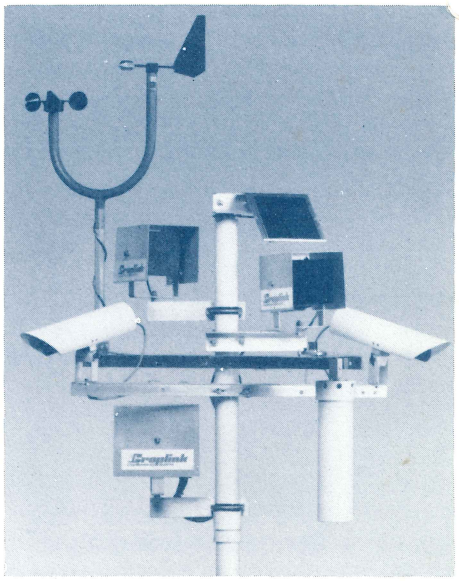
If I put in a Croplink™ Crop Monitoring System now, can I add more field stations in the future and still have a compatible system?

Yes. Even with just one initial field station, additional stations can be "daisy chained" at anytime to monitor multiple fields and crops simultaneously.

Now that I have a full season of Scheduler® Plant Stress Monitor readings stored away, is it possible to get some suggestions on analyzing my data?

Send me a 5¼ inch diskette with your Scheduler® Plant Stress Monitor information, a short written description of what crops were assigned to each field, and an indication of crop condition (high yields, normal yields, problem areas, etc.) and I will send you the following information:

1. Daily averages for each crop.
2. Daily summaries for each field.
3. Comments about anything unusual in your records.



Croplink™ Crop Monitoring Systems

The Agricultural Engineering 50

AE 50 ONE MORE TIME

We are pleased to announce that the Society of Agricultural Engineers has awarded The Carborundum Company an "AE50" award for the development of the Croplink™ Crop Monitoring System. The distinctive honor goes out each year to only a few of the most outstanding innovations in agricultural technology.

The Croplink system now joins the ranks of the Scheduler® Plant Stress Monitor which was awarded an AE50 award in 1987.

Congratulations to Croplink!

THE CARBORUNDUM COMPANY
Instrument Technologies
P. O. Box 391377
Solon, OH 44139

SHOOT DOWN IRRIGATION PROBLEMS . . .

LOOK INSIDE FOR MORE INFORMATION ►

TIEMPO DE TECNOLOGIA

INFORMACION DE SERVICIOS ALTA TECNOLOGIA S.A.

S.A.T. S.A.

Volumen I | Director - Pedro Cabezón M. - Casilla 3354 - Stgo. Chile | Abril 1989

ES EL MOMENTO DE LA TECNOLOGIA

Informativo publicado por S.A.T. S.A., representante en Chile de The Carborundum Company, Standard Oil Engineered Materials y Ryan Instruments empresas norteamericanas especializadas en equipos e instrumentos de alta tecnología agraria.

La agricultura chilena ha logrado en los últimos años un alto grado de desarrollo que le ha permitido alcanzar una importante presencia en los principales mercados internacionales. La consolidación y perfeccionamiento de este crecimiento requiere de una continuada preocupación por la excelencia del proceso de producción, lo que se traduce en más altos niveles de calidad en el producto, y por lo tanto mayor producción por hectárea, costos significativamente menores y acceso a mejores precios.

Esta excelencia de producción es un desafío que enfrenta nuestra agricultura y que sólo puede superarse mediante el empleo de la tecnología más avanzada disponible hoy en el mercado. S.A.T. (Servicios de Alta Tecnología), consciente de esta necesidad, se ha propuesto poner el alcance de los agricultores chilenos dicha tecnología. S.A.T. quiere informar al agricultor sobre las características de los sistemas monitores de control e información de procesos agrícolas de mayor éxito en los principales centros productivos mundiales, sistemas que desde ahora están a su disposición. Esperamos que el presente informativo logrará llamar su atención sobre la importancia de los servicios que ofrecemos y de la conveniencia de adquirir nuestros equipos y sistemas.

Presentamos el Scheduler

En los últimos años, la investigación científica sobre fisiología vegetal ha experimentado un importante avance, no sólo en el plano teórico sino que en la aplicación práctica de sus principales conclusiones y principios al mejoramiento de las cosechas.

Especialmente relevante fue el desarrollo, en 1981, por parte de científicos del Departamento de Agricutura del Gobierno de los EE.UU. (U.S.D.A.), del denominado "Indice de Stress Hídrico de Cosecha", o "CWSI" (Crop Water Stress Index). Este adelanto de la ciencia aplicada, culminación de varias décadas de investigación teórica y práctica, permite determinar el grado de insuficiencia hídrica de las plantas ("Stress") en atención a las condiciones exhibidas por la propia planta. En otras palabras, establece el grado de stress "preguntando" directamente a las plantas acerca de su real situación. Para esto, se consideran los factores relevantes que denotan dicha situación: **temperatura de las hojas, temperatura del aire, humedad relativa y nivel de radiación solar**, los que permiten determinar si en la planta se están cumpliendo las condiciones hídricas acordes con sus requerimientos de **evapotranspiración**.

Scheduler.

Pantalla del Scheduler.

El Scheduler, instrumento desarrollado por Standard Oil Engineered Materials, está diseñado específicamente para medir el stress hídrico en cosechas comerciales.

El Scheduler representa un adelanto substancial y cualitativo en relación a los instrumentos convencionales empleados en la programación de riegos. Dichos instrumentos por lo general se limitan a medir la humedad del suelo. Hasta hace poco tiempo simplemente no existía la tecnología para dar cuenta de otros factores que afectan la salud de las plantas y que por lo tanto influyen decisivamente en sus necesidades de irrigación, tales como enfermedades, plagas de insectos, variaciones en el tipo de suelos, etc. **El Scheduler** ha llenado

ese vacío tecnológico con pleno éxito, debido a que es un sistema monitor de la condición real de las plantas mismas, no de la humedad del suelo. **Constituye, pues, un apoyo indispensable para realizar un diagnóstico plenamente confiable y extraordinariamente útil y rentable de una plantación.**

Contiene los siguientes elementos:

1. Paquete integrado de sensores de alta confiabilidad. Mide por lo tanto con gran precisión las condiciones de la planta y de su entorno inmediato. Un termómetro infrarrojo registra la temperatura de la planta. Mide separadamente la radiación solar y sus sensores proveen igualmente información sobre la temperatura ambiente y la humedad relativa.

2. Microprocesador. La información obtenida directamente de la planta es procesada en segundos y presentada en un formato simple, orientado a su rápida lectura y fácil entendimiento, que pueda servir eficazmente al administrador de la cosecha en sus decisiones más importantes. El formato de presentación de la información ha sido desarrollado tomando en consideración las sugerencias de los propios agricultores durante las pruebas en el terreno.

3. Pantalla especial fácil de leer en cualquier condición solar. No es necesario ningún otro equipo de apoyo. La pantalla constituye un medio completo de comunicación entre el usuario y el sistema.

4. Memoria Interna operada por baterías, capaz de almacenar dos semanas de información desde múltiples sectores del campo. La información acumulada se puede actualizar y renovar automáticamente.

SENSORES: infrarrojos, radiación solar y humedad relativa.

5. Asistencia computarizada incorporada para asegurar precisión al medir. El computador posiciona apropiadamente al usuario para obtener las mejores mediciones.

6. Construcción sólida y fuerte. Los fabricantes saben que para ser una herramienta útil, el Scheduler debe ser capaz de soportar incluso malos tratos en el terreno; sin embargo, debe ser también liviano y compacto. De diseño portátil, ha sido construido para satisfacer estas exigencias.

Al medir el stress de las plantas y presentarlo como índice CWSI, el Scheduler muestra con precisión el estado fisiológico de la cosecha, información que puede ser usada para tomar decisiones correctas respecto del programa de irrigación, así como otras decisiones en relación a la cosecha, antes que las plantas exhiban los signos y síntomas externos del stress. Esto, por supuesto, permite al administrador:

Aumentar utilidades aplicando la cantidad exacta de agua requerida en las etapas críticas del crecimiento, asegurando sí rendimientos óptimos y máxima eficiencia.

Disminuir costos manteniendo un crecimiento máximo de las plantas con los menores recursos posibles (energía, agua, nutrientes, fungicidas, etc.).

Tomar las decisiones apropiadas para su cosecha, particularmente en materia de riego, fundado en los requerimientos reales de las plantas.

Incorporar al regadío nuevos terrenos, previamente no regados, debido al uso más eficiente del agua disponible.

La importancia y eficiencia de esta tecnología ha sido confirmado en el reciente estudio conjunto de CORFO y la Universidad Católica "Análisis del Impacto Económico de las Tecnologías de Riego", el que concluye que "está ampliamente comprobado que la instalación de accesorios sensores, incorporados dentro de los sistemas automatizados, hacen posible un incremento significativo en el rendimiento de los cultivos, puesto que el riego puede ser accionado de acuerdo con las necesidades reales de los cultivos"

Permítanos presentarles a CROP LINK:

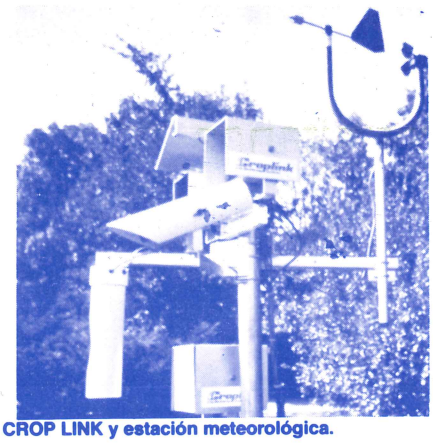
Desarrollado por Standard Oil Engineered Materials, CROP LINK es un sistema completo de información y control de todos los factores y variables que inciden en la calidad de su cosecha. Este sistema, presentado como una estación de campo auto-contenida, mide continuamente durante las 24 horas del día, las siguientes variables críticas: **la temperatura del aire, la humedad relativa, las condiciones del viento y de los principales factores meteorológicos que afectan la cosecha, así como su oportuna predicción, la evapotranspiración y el nivel de stress hídrico de las plantas**. La información obtenida es interpretada por un computador incorporado a la estación y transmitida inmediatamente mediante un sistema de telemetría infrarroja a la estación de control central constituida por cual-

quier sistema PC convencional, a distancias de hasta una milla (1.600 mts.). Para mayores distancias es posible instalar, en bajo costo, los repetidores necesarios.

Como resultado de este sistema, el administrador de la cosecha obtiene desde su casa u oficina un perfil contínuo de las condiciones reales y efectivas de sus plantas, lo que le permite:

Tomar decisiones óptimas de riego, basadas en las necesidades hídricas reales de sus plantas, discriminando por sub-sectores de su campo, algunos de los cuales pueden requerir más agua que otros.

Minimizar los costos de irrigación manteniendo máximos rendimientos.



CROP LINK y estación meteorológica.

Detectar stress hidríco en su cosecha o en parte de ella antes de que se manifieste visualmente, permitiéndole su oportuna y eficaz corrección.

Pronosticar confiablemente las condiciones meteorológicas específicas que afectarán su campo, prevenir heladas y evitar por lo tanto graves daños asociados a su brusca ocurrencia.

Programar, en función de la información obtenida, la irrigación y manejo óptimo de la plantación o sembradío.

El Crop Link, como puede observarse en la ilustración que presentamos, es un equipo sólido, de implantación permanente en el terreno, resistente y de gran durabilidad, construido para ser usado al aire libre y mantención muy fácil. La valiosa información que proporciona es recogida en la estación, en la casa u oficina del agricultor y procesada de forma que su lectura sea simple y fácil, permitiendo una rápida y eficaz decisión en función de las condiciones efectivas del plantío. Ha sido empleado en los últimos años en el mercado de Estados Unidos con espléndidos resultados.

Repetidor de informaciones dadas por el CROP LINK.

El Crop Link contiene los siguientes elementos:

- Paquete completo de sensores, incluyendo termómetros infrarrojo. Cada sistema Crop Link está equipado con un "scheduler".
- Anemómetro y estación meteorológica.
- Control remoto.
- Telemetría Infrarroja.
- Recibidor y transmisor.
- Computador incorporado.
- Software.
- Equipo de autoseguridad y alarma.

DIAGRAMACION E IMPRESION: Gilberto Espínola V. Roberto Espinoza 1130
Teléfono 5569137 – Santiago-Chile

LA NUEVA GENERACION EN TECNICAS DE RIEGO Y MANEJO TECNOLOGICO DE LA COSECHA

ENVIENME INFORMACION SOBRE

Schudeler ☐
Crop Link ☐
Ryan ☐

Nombre _____

Dirección _____

Ciudad _____

Empresa _____

Cargo _____ Fono _____

S.A.T. S.A.

Casilla 3354 SANTIAGO-CHILE

Termógrafos producidos por Ryan Instruments L.P.

Las gráficas de los termógrafos Ryan son una prueba irrefutable en cualquier corte del mundo. Esto se debe a que siendo una Empresa con más de 70 años ha creado una jurisprudencia por cuanto siempre se ha hecho parte en los juicios, en que se ha questionado la eficiencia del termógrafo. Siendo siempre los fallos favorables a Ryan.

Ryan Instruments fabrica diferentes tipos de termógrafos.

Del tipo mecánico para ser usados en el control de las temperaturas durante el transporte tanto interno como de ultramar y para control de temperaturas en cámaras de frío, fumigación, etc.

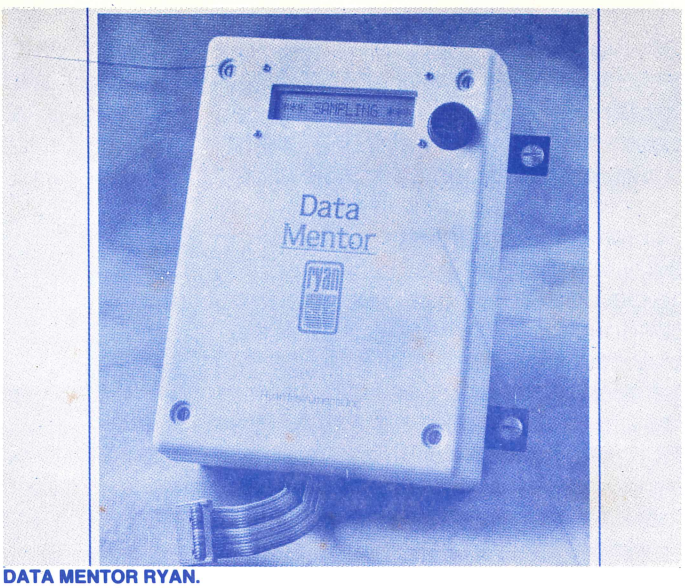
Y otro electrónicos digitales como el que presentamos a continuación.

DATA MENTOR RYAN

Registro de temperatura transportable, de 12 canales y con análisis computarizado rápido.

¿Ha tratado de estar alguna vez en 12 partes diferentes a un mismo tiempo? Ryan le tiene la respuesta.

El nuevo Data Mentor Ryan es un registrador portátil que posee 12 canales independientes los cuales le permite registrar simultáneamente 12 puntos diferentes cuando necesite monitorear la temperatura. El Data Mentor posee 256 K de memoria y almacena sobre 5,760 mediciones por canal y está preparado para traspasar esta información a su computador compatible a una velocidad tan rápida como 9600 baudios. Posee baterías de larga vida que permite utilizarlo por más de 60 días (La opción de ahorro de energía le permite utilizarlo por 120 días). Los intervalos de muestreo son seleccionables en un rango de 1 a 999 minutos.



DATA MENTOR RYAN.

El Data Mentor registra con una tolerancia de + – ½° F y con una resolución de 1/10° F en rangos que fluctúan entre –48 a 130° F y 0 a 300° F. Es seleccionable la escala de temperatura Celsius o Fahrenheit. El Mentor puede ser cargado en el campo con un computador portátil o puede ser desconectado de su caja protectora impermeable para cargarse en el PC de su oficina.

Ryan le proporciona un paquete de software de operación simple y a una alta velocidad de transmisión de datos. El software tiene un paquete estadístico, formatos para traspaso de datos desde otros programas de software y proporciona informes detallados para documentación.

El Data Mentor está diseñado para medir las temperaturas en ambientes desfavorables: cámaras de frío, fumigación, túneles de frío, temperaturas ambientes, agricultura, camiones frigoríficos, etc.

Dimesión:
209 mm x 134 mm x 64 mm

S.A.T. S.A.

CASILLA 3354

SANTIAGO CHILE

Tecnología para control de calidad de riego y calidad de su producción.

CORREOS DE CHILE

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